

***Appendix E***  
***Brochure Titled “Gas Pipelines”***  
***[see Section 2.2.1, 148.105(b)(1)]***

## Gas Pipelines



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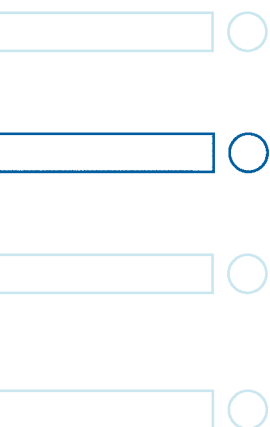
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**Taking Gas and Power Further**



**Shell Gas & Power**

**For decades Shell has been involved in most of the continents in the development of their pipeline systems for gas transportation and distribution. Shell may be more visible as a leader in the Liquefied Natural Gas (LNG) industry, but in fact about 46% of all Shell's equity gas production is transported from production field to market entirely via gas pipelines.**



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Gas transportation by pipeline first came into widespread use in the 1940s in the USA, when technology became available for long-distance high-pressure pipelines. By the mid 1960s all of the lower 48 states of the USA were connected by a substantial network of transportation pipelines – vital conduits for the movement of energy from the gas producing areas in the south (including substantial Shell Oil acreage) to the consuming areas nationwide.

Meanwhile in 1959 Shell's discovery of the giant Groningen gas field in the Netherlands transformed the Dutch energy scene which had been reliant on expensive coal. Between 1964 and 1975 the Netherlands gas transportation system was developed by a Shell interest company. Export pipelines were also built by Shell interest companies in the 1960s to transport gas from The Netherlands to Germany,

France, Belgium and Italy. Thus began the development of the natural gas industry in Europe, led by Shell, and founded on a network of onshore gas transportation pipelines.

This was extended when Shell and others discovered more major reserves in the UK sector of the North Sea, which were developed by subsea pipelines such as Shell Expro's FLAGS pipeline. This stimulated development of the integrated UK national gas transmission system. Further reserves were found in the Norwegian sector of the North Sea, including Shell's discovery of the huge Troll field in 1979. These too were evacuated to market in Europe by subsea pipelines. By 1995 three Shell interest subsea pipelines connected Norwegian gas reserves to Continental European markets. Additional supplies became available from the CIS, Central Asia and from other countries of Europe.

From these beginnings in North America and in Europe, gas transportation by pipeline has spread to most continents either as operational reality or in the form of development projects for future implementation. Shell, often through joint venture companies, is at the heart of this success story.

## **G A S   P I P E L I N E S**

- In operation, mostly unseen and unheard
- The arteries of the gas system – bringing vital energy to where it is needed
- The backbone of the gas business – connecting the sources of supply to the areas of demand, and thereby supporting the needs of producers and consumers alike
- Includes main trunkline transmission systems and regional transmission systems and lower-pressure distribution grids
- Enables natural gas, a valuable and clean energy source, to supply over 23% of total primary energy consumption worldwide.



## SHELL'S CURRENT PIPELINE ASSETS

**Pipelines are key assets and Shell companies around the world own, or have an interest in, some 90,000 km of onshore and offshore pipelines and a significant part of these transport gas.**

Onshore Europe, Shell's interests include gas transmission and distribution pipeline systems in the Netherlands, Germany and Belgium. These interests date from the inception of the natural gas industry in Europe, when Shell formed joint venture companies with other producers and with host government entities to develop the gas transportation and distribution infrastructure.

Mature companies such as NAM, Gasunie, BEB, Ruhrgas, other German companies, and Distrigaz, in Belgium were all formed using Shell expertise and human resources. Shell's ongoing shareholder role in these companies facilitates continued cooperation and cross-fertilisation.

Shell's offshore gas pipeline interests centre around the North Sea, with major offshore transmission pipelines bringing gas from offshore fields in the UK, Dutch and Norwegian sectors to shore for further processing and/or distribution. Here too Shell has been a founding member of the joint venture companies formed to own these pipelines. Often, Shell is also operator, as for example in the case of the UK interests operated by Shell Expro. Other Shell interest gas transportation joint ventures include Zeepipe, Europipe, Norfra, NOGAT and WGT.



Laying of gas pipeline from the Groningen Field, the Netherlands

In North America, Shell has built up substantial gas pipeline interests in both the USA (including the Gulf of Mexico) and in Canada.

In South America up to the early 1990s, gas developments were largely in the hands of state-owned monopolies. International gas trade was then limited. The advent of liberalisation and competition provided renewed growth. Shell and others are now shareholders (with state entities) of the Bolivia-Brazil pipeline linking the considerable gas reserves of Bolivia to the major markets of Brazil. In Brazil, Shell is an active shareholder in the country's largest gas distribution company Comgas, which holds the concession for gas distribution in the province of São Paulo and thereby serves the industrial heartland of Brazil. Through these and other developments, the Southern Cone is now well on its way to achieving the benefits of regional energy integration as seen earlier in North America and Europe.

Shell's interests in Africa

range from onshore gas transmission systems in Egypt – transporting gas from the Western Desert to the local distribution network in Alexandria – to Nigeria – where there is considerable involvement in gas gathering pipelines and in feed pipelines to the Nigerian LNG plant.

In Asia, Shell has significant interests in gas transmission in Brunei, and in the Malaysian provinces of Sabah and Sarawak. More recently, Shell, as shareholder and operator, has succeeded in developing the Malampaya project in the Philippines, involving 560 km of 24 inch offshore gas pipeline, much of which is at greater than 500 metres water depth.

In the Middle East, Shell has significant interests in gas transmission, in for example, Oman and Syria. In both cases joint venture operating companies were formed to develop the gas transmission infrastructure using Shell know-how and resources. The resulting extensive pipeline networks enable each country to fully utilise its natural resources. Shell was involved in the design, construction and operation of the Oman pipeline system with a 350 km, 48 inch onshore gas trunkline feeding the new Oman LNG plant.

Finally, in Australasia, Shell has pipeline interests in Australia and New Zealand. Shell is a founder shareholder of the Australian North West Shelf venture including interests in the main offshore transmission pipeline bringing gas from the North West Shelf to the onshore LNG plant.



## SHELL'S INVOLVEMENT THROUGHOUT THE VALUE CHAIN

As well as interests in midstream gas transportation activities, Shell is well known for upstream involvement, exploration and production. Downstream activities include gas distribution, gas marketing and trading, using either Shell's own pipeline system or third party pipelines. Shell has marketed pipeline gas to industrial and commercial customers in the UK since 1991, and more recently in the USA, Shell affiliate Coral Energy has become involved in pipeline gas and electricity marketing and trading to customers. This combination of skills along the whole value chain, from upstream to downstream, and involving ownership of physical pipeline assets as well as contractual assets, represents an unparalleled breadth of expertise in and around the gas pipeline business.



Karratha onshore gas treatment plant, Australia

## PROJECT MANAGEMENT

Shell can draw on many years of experience in the design and construction of major onshore and offshore pipelines, and has the skills in-house to develop proposals and to manage these projects from concept through implementation and on to operation.

Shell's involvement in pipeline projects covers the full range of terrain types and environmental conditions. We have relevant experience from previous projects ranging from the flat hot deserts of the Middle East, the cold arctic conditions of northern Siberia, the swamps of Nigeria, the deep waters of the Gulf of Mexico and the mountainous terrain high up in the Andes.

Effective management of capital investment projects is a key business driver. To support these projects Shell is able to call on a unique and diverse range of the latest skills and experience, including techniques such as Contracting and Procurement Strategy, Value Assurance Reviews and Functional Value Analysis. The scale of

Shell's worldwide involvement in pipeline development projects places it in an ideal position to take maximum advantage of the leverage offered by global procurement agreements and savings through Shell's Internet site with Commerce One.

## OPERATIONS & MAINTENANCE

Pipelines have proved to be the safest, most reliable and environmentally friendly means of bulk oil and gas transport. Nevertheless, for most of their length pipelines are located in the public domain and therefore require special attention during operation to minimise the risk of failure, and thereby to safeguard the public and protect the environment. A key focus for Shell companies involved in pipeline operations has been the continuous improvement of all aspects of the management of pipeline integrity.

We have extensive worldwide experience acquired whilst operating and maintaining pipeline systems, both onshore and offshore, and skills gained in developing and implementing Pipeline Integrity Management systems (PIMS) and supporting methodologies and 'tools'. These place Shell in a strong position to improve integrity and maintenance management practices and to achieve Cost Leadership in pipeline operations.



Gas plant in the Omar Field, Syria



## DEVELOPMENTS IN PIPELINE TECHNOLOGY

**Shell has constantly been at the leading edge of technological developments in the gas pipeline industry. This has engendered a 'can do' approach to new developments. Moving to the deeper waters brought new challenges. Shell developed proprietary understanding of the flow behaviour of pipelines, and this enabled commercialisation of deep-water fields through the two-phase FLAGS pipeline and the dense-phase Fulmar pipeline.**

The Troll development showed a further leap ahead when Shell (as technical leader, and as operator of Troll in the development stage) was able to implement full stream pipeline transportation from a minimum-facilities platform to shore, enabling lower cost shore-based processing. Troll also set the record for large diameter heavy walled pipe in the 350 metre water depth of the Norwegian trench. The dry gas pipelines from Norway to landfall were also a record, being over 1,000 km long without intermediate recompression. Shell's implementation of the Mensa pipeline in the 1,700 metre deep water of the Gulf of Mexico was in its time a depth record.

The accumulation of Shell's knowledge and experience from prior activities is today available to make challenging new projects possible. However, natural gas is a relatively mature sector of the pipeline industry, and new technology development is therefore mainly driven from other sectors.

Much of the technology development in Shell is focused on maintaining pipeline integrity and quantitative inspection tools such as intelligent pigs.



Troll gas platform, off Bergen, Norway

## PROTECTING THE ENVIRONMENT

**Transporting oil and gas, sometimes through densely populated areas, calls for safeguards that must be at the forefront of any pipeline operations undertaken by Shell companies.**

For all pipelines, protection of the public and the environment is a paramount consideration and a range of measures must be implemented to ensure that this is not jeopardised at any time. During the design and construction of a pipeline such measures include environmental surveys to assess not only the impact on the land, but also the effects on communities, wildlife and plants. In sensitive areas a reduced pipeline right-of-way or special construction techniques such as directional drilling or trenchless construction may be applied to ensure minimal environmental disturbance.

During pipeline operations, measures include regular surveillance of the pipeline route, focusing on high-risk areas and systematic liaison with third parties working in areas adjacent to the pipeline, especially where this involves excavation. An example of the latter is the 'one-call' procedures that are being implemented in some countries.

Development of a satisfactory environmental solution, as required by Shell's policy on sustainable development, depends on close and continuing collaboration between affected communities, engineers, operators, the regulatory authorities and other stakeholders, including the public and environmental organisations.



## COMMERCIAL AGREEMENTS

**The pipeline projects of Shell are often, but not always, joint ventures with other entities, which may be representatives of the state or other private companies or stakeholders.**

The joint venture cooperation is normally formalised in a written shareholders agreement. Shell has wide experience in the negotiation of agreements for the creation of gas pipeline joint ventures of all types. Whatever the structure, the desire is for a win/win relationship between the partners based on openness, clarity and good professional standards. Bringing together the stakeholders so that their legitimate separate interests can be fulfilled whilst still aligning energies for the common good is a key factor for a successful pipeline project. Shell is skilled in guiding the process from initial Heads of Agreement or Memorandum of Understanding through to full shareholders agreements which will remain effective for decades of joint venture operations.

Other agreements may set out the commercial arrangements for the pipeline and will include an operating agreement that will set out the technical and administrative rules by which the pipeline system will be operated. Where



Replanting coastal dunes after pipeline laying

the pipeline crosses national borders or transits a country, the agreements will normally be established within a framework of treaties between the governments of the producing, transit and consuming countries. These treaties will mark the agreement between the countries supporting the establishment of an international project, and the creation of acceptable fiscal and legal regimes for the sections in the different countries.

All of the above agreements need to be tailored to the specifics of the project. Rarely is it possible, or desirable, to simply use a pro-forma agreement. However, Shell's involvement in so many earlier projects involving precedential agreements means that it is extremely well placed to assist development of the complex but vital documentation for new projects.

## EXPLANATORY NOTE

This brochure reviews the scope of the natural gas and power related businesses of the Royal Dutch/Shell Group of Companies (Shell). It describes the energy solutions that Shell offers to our customers, co-venturers and the communities with whom we work. Shell has five core business sectors, encompassing:

**Exploration and Production** searches for, finds and produces oil and gas. Builds the infrastructure needed to deliver hydrocarbons to market.

**Gas & Power** commercialises natural gas, supplies liquefied natural gas, develops markets and infrastructures, markets and trades natural gas and electricity, develops power plants and converts Gas to Liquids.

**Oil Products** sells and markets transportation fuels, lubricants and speciality products. Refines, supplies, trades and ships crude oil and petroleum products. Provides consultancy services to third parties based on Shell technology and experience gained in Shell operations.

**Chemicals** produces and sells base chemicals, petrochemical building blocks and polyolefins globally.

**Renewables** generates 'green' electricity and provides renewable energy solutions. Develops and operates wind farms, manufactures and markets solar systems and grows sustainably managed forests.

**Other activities** other business activities include: Shell Hydrogen, Shell Trading and Shell Consumer.

These business sections operate globally and are supported by Shell service companies in London and The Hague, and Shell's research laboratories. Shell's global presence, local knowledge and worldwide pool of expertise and skilled people are available to meet our customers' needs in gas and power.

## SHELL'S BUSINESS PRINCIPLES

Shell Companies operate under a code of conduct called the Statement of General Business Principles. These principles govern the way we operate and provide, for our employees and for the outside world, an ethical framework which is both mandatory and transparent. This statement has been a public document for the last 20 years.

The Group publishes 'The Shell Report' which provides information on its economic, environmental and social performances set out against the Group's Business Principles.

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